Sandia National Laboratories/New Mexico

PROPOSAL FOR NO FURTHER ACTION ENVIRONMENTAL RESTORATION PROJECT SITE 49, BUILDING 9820 DRAINS OPERABLE UNIT 1295

June 1996

Environmental Restoration Project

United States Department of Energy
Albuquerque Operations Office

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SITE 49, BUILDING 9820 DRAINS
OPERABLE UNIT 1295
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United States Department of Energy

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1. INTRODUCTION

1.1 ER Site 49, Building 9820 Drains

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a no further action (NFA) decision based on confirmatory sampling for Environmental Restoration (ER) Site 49, Building 9820 Drains, Operable Unit (OU) 1295. ER Site 49 is listed in the Hazardous and Solid Waste Amendments (HSWA) Module IV (EPA August 1993) of the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Permit (NM5890110518-1) (EPA August 1992).

1.2 SNL/NM Administrative NFA Process

This proposal for a determination of a NFA decision based on confirmatory sampling was prepared using the criteria presented in Section 4.5.3 of the SNL/NM Program Implementation Plan (PIP) (SNL/NM February 1995) . Specifically, this proposal "must contain information demonstrating that there are no releases of hazardous waste (including hazardous constituents) from solid waste management units (SWMUs) at the facility that may pose a threat to human health or the environment" (as proposed in 40 CFR 264.514[a] [2]) (EPA July 1990). The HSWA Module IV contains the same requirements for an NFA demonstration:

> "Based on the results of the RFI [RCRA Facility Investigation] and other relevant information, the Permittee may submit an application to the Administrative Authority for a Class III permit modification under 40 CFR 270.42(c) to terminate the RFI/CMS [corrective measures study] process for a specific unit. This permit modification application must contain information demonstrating that there are no releases of hazardous waste including hazardous constituents from a particular SWMU at the facility that pose threats to human health and/or the environment, as well as additional information required in 40 CFR 270.42(c) (EPA August 1993)."

If the available archival evidence is not considered convincing, SNL/NM performs confirmatory sampling to increase the weight of the evidence and allow an informed decision on whether to proceed with the administrative-type NFA or to return to the site characterization program for additional data collection (SNL/NM February 1995).

The Environmental Protection Agency (EPA) acknowledged that the extent of sampling required may vary greatly, stating that:

> the agency does not intend this rule [the second codification of HSWA] to require extensive sampling and monitoring at every SWMU. . . . Sampling is generally required only in situations where there is insufficient evidence on which to make an initial release determination. . . . The actual extent of sampling will vary . . . depending on the amount and quality of existing information available (EPA December 1987).

This request for an NFA decision for ER Site 49 is based primarily on analytical results of confirmatory soil samples collected at the site. Concentrations of site-specific constituents of concern (COCs) detected in the soil samples were first compared to background 95th percentile or upper tolerance limit (UTL) concentrations of COCs found in SNL/NM soils (IT March 1996). If no SNL/NM or other relevant background limit was available for a particular COC, or if the COC concentration exceeded the SNL/NM or other relevant background limit, then the constituent concentration was compared to the proposed 40 CFR Part 264 Subpart S (Subpart S) or other relevant soil action level for the compound (EPA July 1990). If the COC concentration exceeded both the background limit and relevant action level for that compound, or if no background limit or action level has been determined or proposed for the constituent, then a risk assessment was performed. The highest concentration of the particular COC identified at the site was then compared to the derived risk assessment action level to determine if the COC concentration at the site poses a significant health risk.

A site is eligible for an NFA proposal if it meets one or more of the following criteria taken from the Environmental Restoration Document of Understanding (NMED November 1995):

- NFA Criterion 1: The site cannot be located or has been found not to exist, is a duplicate potential release site (PRS) or is located within and therefore, investigated as part of another PRS.

- NFA Criterion 2: The site has never been used for the management (that is, generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes and/ or constituents or other CERCLA hazardous substances.

- NFA Criterion 3: No release to the environment has occurred, nor is likely to occur in the future.

- NFA Criterion 4: There was a release, but the site was characterized and/or remediated under another authority which adequately addresses corrective action, and documentation, such as a closure letter, is available.

- NFA Criterion 5: The PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use.

Review and analysis of the ER Site 49 soil sample analytical data indicate that concentrations of COCs at this site are less than (1) SNL/NM or other applicable background limits, or (2) proposed Subpart S or other action levels, or (3) derived risk assessment action levels.

ER Site 49 is being proposed for an NFA decision based on confirmatory sampling data demonstrating that hazardous waste or COCs that may have been released from this SWMU into the environment pose an acceptable level of risk under current and projected future land use (Criterion 5).

1.3 Local Setting

SNL/NM occupies 2,829 acres of land owned by the Department of Energy (DOE), with an additional 14,920 acres of land provided by land-use permits with Kirtland Air Force Base (KAFB), the United States Forest Service (USFS), the State of New Mexico, and the Isleta Indian Reservation. SNL/NM has been involved in nuclear weapons research, component development, assembly, testing, and other research and development activities since 1945 (DOE September 1987).

ER Site 49 is located in the Manzanita Mountains foothills within the boundaries of the USFS Withdrawn Area, and is approximately 2/3 of a mile east of the eastern boundary of Kirtland Air Force Base (KAFB). It is reached via Coyote Springs Road, an improved gravel road that branches off of Lovelace Road and runs in an easterly direction up Lurance Canyon (Figure 1-1). The site lies in the lower reaches of a minor north-sloping tributary which is on the south side of the main Lurance Canyon drainage called Coyote Del Arroyo. This tributary drains mountainous terrain to the south of the site with elevations ranging from 6,000 to 7,200 feet AMSL. Rocks exposed in the immediate area of Site 49 include Precambrian metamorphic rocks unconformably overlain by Paleozoic limestone and other sedimentary rocks (Myers and McKay 1976). A relatively thin veneer of stream-deposited alluvial material that contains abundant gravel, cobbles, and boulders is present in the bottom of drainages in this area. No wells are located in the immediate vicinity of ER Site 49, so the depth to groundwater beneath the site is unknown. The nearest groundwater monitoring well (designated TSA-1) is located approximately 3/4 of a mile northeast of the site in Lurance Canyon. Depth to groundwater in TSA-1 was measured at 160 feet below the ground surface in November 1987; a 1991 measurement in this well was essentially the same as the 1987 level (SNL/NM March 1995). Local groundwater flow may be directed toward the lower elevation areas of Lurance Canyon area where some discharge may occur at small seeps and springs such as Coyote Springs, which is located approximately 1 mile west of ER Site 49. The nearest production wells are northwest of the site and include KAFB-2, KAFB-4, and KAFB-7 which are approximately 6.6 to 8 miles away (SNL/NM June 1995).

The surficial geology at ER Site 49 is characterized by the stony/sandy loam soils of the Tesajo-Millet Series. About 20% of the surface of these soils is covered with granitic stones and boulders varying from one to 15 feet in diameter (USDA 1977). Few other data exist concerning subsurface geology. Shallow soil sample borings around the Site 49 drain outfall encountered what appeared to be bedrock or a highly calcified or cemented horizon between 13 and 14 feet below grade at that location (Figure 1-2) (SNL/NM October 1994a).

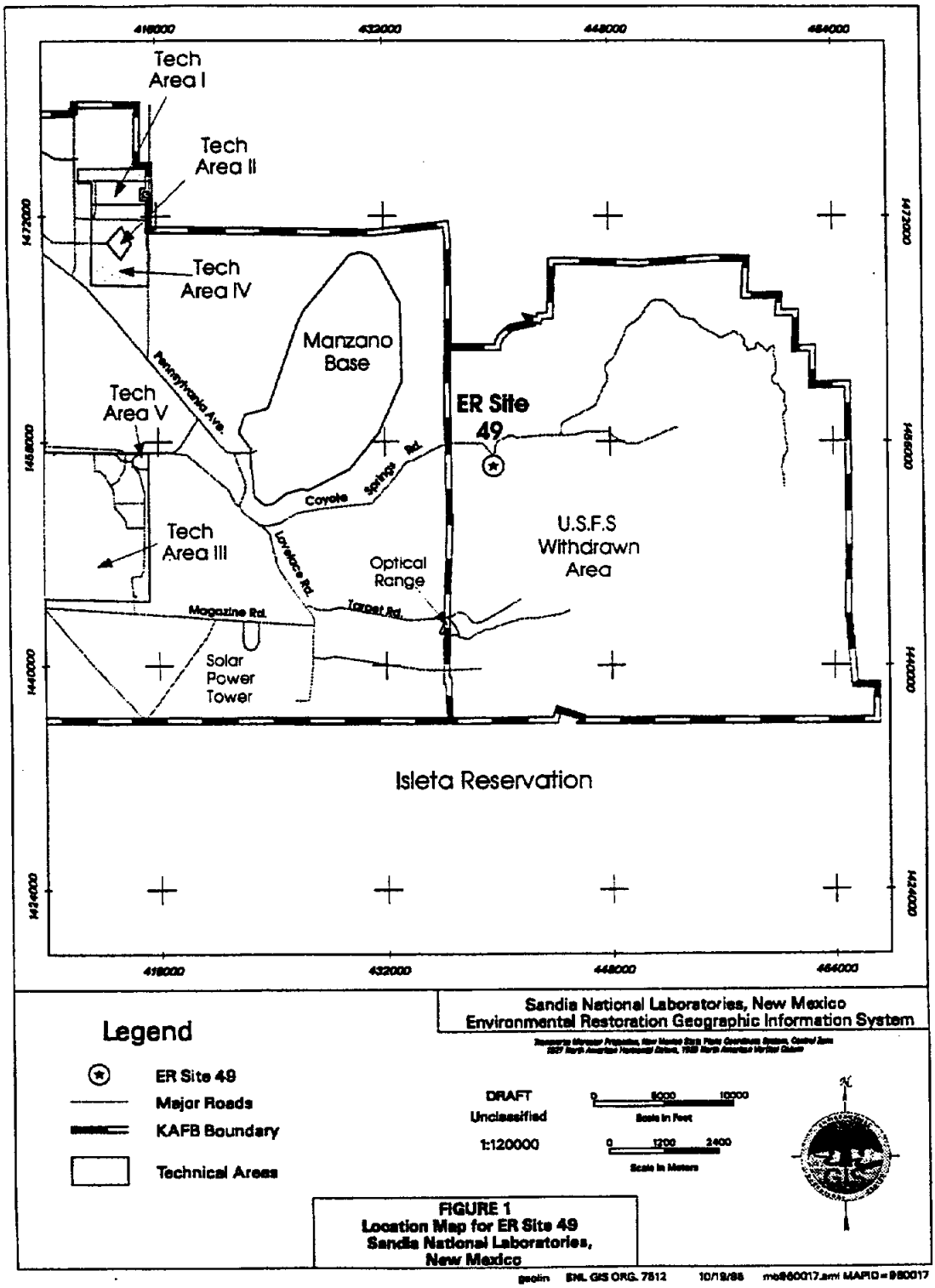

Figure 1-1: ER Site 49 Location Map

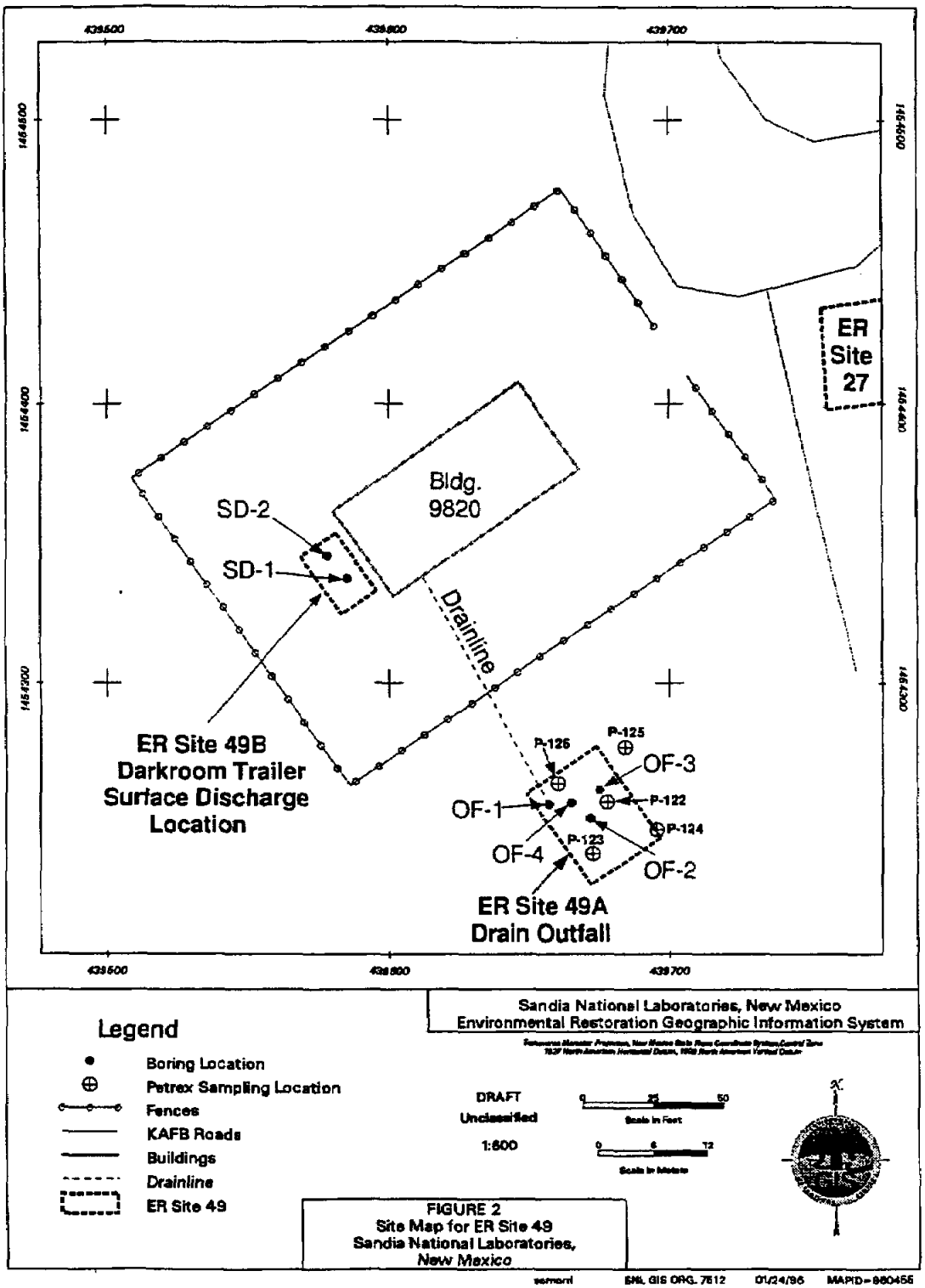

Figure 1-2: ER Site 49 Site Map

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2. HISTORY OF THE SWMU

2.1 Sources of Supporting Information

In preparing the confirmatory sampling NFA proposal for ER Site 49, available background information was reviewed to quantify potential releases and to select analytes for the soil sampling. Background information was collected from SNL/NM Facilities Engineering drawings and interviews with employees familiar with site operational history.

The following sources of information, hierarchically listed with respect to assigned validity, were used to evaluate ER Site 49:

- Confirmatory shallow subsurface soil sampling conducted in October 1994 and May 1995 (SNL/NM October 1994a and May 1995a);
- Three survey reports, including data from a surface radiation survey (RUST December 1994), a geophysical survey (Lamb 1994), and a passive soil gas survey (NERI June 1995);
- RCRA Facilities Investigation Work Plan for OU 1295, Septic Tanks and Drainfields (SNL/NM March 1993). This document contains information from interviews with past employees of the site;
- Photographs and field notes collected at the site by SNL/NM ER staff at ER Site 49;
- SNL/NM Facilities Engineering building drawings;
- SNL/NM Geographic Information System (GIS) data; and
- The RCRA Facility Assessment (RFA) report (EPA April 1987).

2.2 Previous Audits, Inspections, and Findings

ER Site 49 was first identified as a potential release site in the Comprehensive Environmental Assessment and Response Program (CEARP) report which noted (incorrectly) that the Building 9820 septic tank and drainfield were probably contaminated with some high explosives and small quantities of solvents (DOE September 1987). As discussed in Section 2.3, there is no septic tank or drainfield at this site. ER Site 49 was also listed in the RFA report to the EPA in 1987 as Site 126 (EPA April 1987).

2.3 Historical Operations

The following historical information has been excerpted from several sources, including SNL/NM March 1993 and IT March 1994.

Building 9820 is a rectangular one-story metal building constructed in 1958 that was used for the synthesis of high explosive compounds, photoprocessing, woodworking, and metal machining in support of weapons testing. There were five floor drains and a hand sink in the building that discharged to a 4-inch diameter drainline discussed below. A machine shop was opened in the mid-1960s and may have discharged solvents into the floor drains. Very small quantities of black and white film were processed from the mid-1970s to 1988 inside the building and in the darkroom trailer parked on the west side of the building. Waste solutions may have been discharged from the trailer to the ground. Inside the building, developer and rapid-fix solutions and rinse water were probably discharged down the drain. Washing of nickel-cadmium batteries with dilute acetic acid in the past could have discharged up to 1 gallon of solution into drains or sinks. The remote location of the building prevented connection to a piped water supply; bottled water was used for drinking. Non-potable water was trucked to a 1,000-gallon storage tank at the facility. No estimates of water use exist for past operations. The facility has not been occupied since 1988. On November 17, 1995 the distal end of the Building 9820 drainpipe was sealed with mortar to eliminate the possibility of any additional releases (SNL/NM November 1995). The floor drains inside Building 9820 were visually inspected on May 14, 1996, and appear to be operational (SNL/NM May 1996). These drains will not be sealed to allow the option of connecting the building to a holding tank in the future.

ER Site 49 includes (1) the area immediately around the drainpipe outfall that drained effluent from Building 9820 (hereinafter referred to as the "drain outfall"), and (2) the area where photoprocessing solutions may have been discharged from the photographic darkroom trailer (hereinafter referred to as the "surface discharge location") (Figure 1-2). The drain outfall lies about 95 feet southeast of Building 9820, and discharged to a small nearby arroyo. The upper photograph in Figure 3-1 shows the drain outfall partially hidden in the reeds in the foreground. Building 9820 and the former location of the darkroom trailer on the left side of the building can be seen in the background. The area immediately around the two potential release points at this site (shown on Figure 1-2) encompasses approximately 0.04 acres of land at an average mean elevation of 6,045 feet above mean sea level (AMSL).

Based on the activities performed at the facility, the primary COCs in the investigation were explosives residue (such as Baratol), photoprocessing chemicals (e.g. cadmium, hexavalent chromium, cyanide, and silver), and volatile organic compounds such as methanol, toluene, and trichloroethylene (TCE). Potential surface contamination from explosives testing conducted in the vicinity of Building 9820 in the late 1950s is not included as part of OU 1295 assessment activities for ER Site 49. It is being investigated as part of the OU 1335 characterization program for ER Site 27.

3. EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics

There are no safeguards inherent in the drain system from Building 9820 or in facility operations that could have prevented past releases to the environment.

3.2 Operating Practices

As discussed in Section 2.3, releases of effluent to the drain outfall and to the ground surface near the darkroom trailer could have occurred while the facility was occupied. Hazardous wastes were not managed or contained at ER Site 49.

3.3 Presence or Absence of Visual Evidence

No visible evidence of soil discoloration, staining, or odors indicating residual contamination was observed when soil samples were collected around the drain outfall in October of 1994 (SNL/NM October 1994a), and at the darkroom trailer surface discharge location in 1995 (SNL/NM May 1995a). Past discharges from the outfall resulted in the growth of reeds in the discharge area that dies back in dry weather and experiences re-growth in wet periods. Over time a thick mat of decaying vegetation has built up around the outfall. The reeds cover an area approximately 20 feet in diameter around the outfall and does not extend to the bottom of the arroyo, probably indicating past intermittent and low volume releases.

3.4 Results of Previous Sampling/Surveys

A surface radiological survey conducted by RUST Geotech around Building 9820 in November 1993 did not detect any point or area anomalies above background levels within ER Site 49 (RUST December 1994).

A geophysical survey performed at the site in November 1994 was intended to identify any subsurface areas with high moisture content which might indicate a contaminant plume from past releases. The results of the geophysical survey were inconclusive, with no definitive indications of high moisture concentrations even in the area of reeds at the end of the drainline (Lamb 1994). Therefore, the geophysical survey results were not used as a guide in the soil sampling effort.

The passive soil-gas survey conducted in June 1994 used PETREX™ sampling tubes to attempt to identify any releases of VOCs and SVOCs to the drain outfall (SNL/NM June 1994). A PETREX™ tube soil-gas survey is a semi-quantitative screening procedure that can be used to evaluate the presence or absence of many volatile and semivolatile organic compounds. The advantages of this sampling methodology are that large areas can be surveyed at relatively low cost, the technique is highly sensitive to organic vapors, and the result produces a measure of soil vapor chemistry integrated over a two- to three-week period rather than at one point in time.

Building 9820 outfall location. October 6, 1994.
View looking north toward Building 9820.

Collecting soil samples near the Building 9820 outfall.
October 6, 1994. View looking west.

Figure 3-1: ER Site 49 Photographs

Each PETREX™ soil-gas sampler consists of two activated charcoal-coated wires housed in a reusable glass test tube container. At each sampling location, sample tubes are buried in an upside down position so that the mouth of the sampler is about 1 foot below grade. Samplers are left in place for a two- to three-week period, and are then removed from the ground and sent to the manufacturer, Northeast Research Institute (NERI), for analysis using thermal desorption-gas chromatography/mass spectrometry. The analytical laboratory reports all sample results in terms of "ion counts" instead of concentrations, and identifies those samples that contain compounds above the PETREX™ technique detection limits. NERI considers a "hit" for individual compounds (such as perchloroethene [PCE] or trichloroethene[TCE]) to be greater than 100,000 ion counts, and 200,000 ion counts for mixtures of compounds (BTEX or aliphatics, for example) (NERI June 1995).

A PETREX™ sampler was placed at five locations (PETREX™ locations 122 through 126 on Figure 1-2) around the drain outfall at this site (SNL/NM June 1994). Aliphatic compounds (C4-C11 cycloalkanes) were identified at a concentration above the PETREX™ technique detection limit on the single sample wire that was analyzed in sampler P-123, and on the duplicate wire that were analyzed in sampler P-126 (Figure 1-2). No other VOCs or SVOCs were found in detectable quantities in the other four PETREX™ tubes placed around the drain outfall at this site (NERI June 1995). Subsequent laboratory analysis of soil samples collected in the immediate vicinity of the PETREX™ sample locations did not detect organic contaminants in the material. The analytical results of the ER Site 49 passive soil gas survey are included in Appendix A.1.

Also, for QA/QC duplicate comparison purposes, both (rather than just one) of the coated wires were analyzed in two of the five samplers placed at the site. PCE and TCE ion count values for both the original and duplicate analyses were in good agreement with each other and did not indicate the presence of these contaminants at this site. The BTEX and aliphatic compound mixture ion count values for the original versus the duplicate analyses do not appear to be in good agreement (Appendix A.1). NERI states that PETREX™ duplicate sample reproducibility is not only influenced by the levels of compounds detected, but is also significantly influenced by the number of compounds summed to report a mixture. NERI also states that the highest variability is generally observed in the reporting of mixtures such as BTEX and aliphatic compounds, and that orders of magnitude (rather than actual numerical differences) are the accepted parameter for evaluation of PETREX™ data (NERI June 1995).

3.5 Assessment of Gaps in Information

Process knowledge and other available information was used to help identify the most likely COCs that might be found in soils around the drain outfall and darkroom trailer surface discharge location, and to help select the types of analyses to be performed on soil samples collected from the site. While the history of past releases at the site is incomplete, analytical data from confirmatory soil samples collected in October 1994 and May 1995 (discussed below) are deemed to be sufficient to determine whether releases of COCs occurred at the site.

3.6 Confirmatory Sampling

Although the likelihood of hazardous waste releases at ER Site 49 was considered low, confirmatory soil sampling was conducted in October 1994 from the area immediately around the drain outfall (SNL/NM October 1994a), and in May 1995 at the darkroom trailer surface discharge location (SNL/NM May 1995a) to determine whether COCs above background or detectable levels had been released via the drains to the environment at this site. The confirmatory soil sampling program was performed in accordance with the rationale and procedures described in the Septic Tank and Drainfields (ADS-1295) RCRA Facility Investigation Work Plan (SNL/NM March 1993), and addenda to the Work Plan developed during the OU 1295 project approval process (IT March 1994 and SNL/NM November 1994). The lower photograph in Figure 3-1 shows the soil sample collecting operation around the drain outfall.

A summary of the types of samples, number of sample locations, sample depths and analytical requirements for confirmatory soil samples collected at this site is presented in Table 3-1. Auger refusal occurred above the deep sampling interval in one of the four drain outfall boreholes; therefore, samples were collected from seven instead of the eight original designated sample intervals at this location.

Table 3-1
ER Site 49: Confirmatory Sampling Summary Table

Sampling Location	Analytical Parameters	Number of Borehole Locations	Top of Sampling Intervals at Each Boring Location	Total Number of Investigative Samples	Total Number of Duplicate Samples	Date(s) Samples Collected
Drain outfall	VOCs	4	1', 11'	7	1	10/6/94
	SVOCs	4	1', 11'	7	1	
	RCRA metals + Cr^{6+}	4	1', 11'	7	1	
	TNT screen	4	1', 11'	7	1	
	Cyanide	4	1', 11'	7	1	
	Isotopic uranium	4	1', 11'	7	1	
	Soil pH	4	1', 11'	7		
	Gamma Spec. composite	4	1', 11'	2		
Darkroom trailer surface	RCRA metals + Cr^{6+}	2	1', 11'	4		5/23/95
discharge location	Cyanide	2	1', 11'	4		
	Soil pH	2	1', 11'	4		

Notes
Cr^{6+} = Hexavalent chromium
RCRA = Resource Conservation and Recovery Act
Spec. = Spectroscopy
SVOCs = Semivolatile organic compounds
TNT = Trinitrotoluene
VOCs = Volatile organic compounds

Soil samples were collected from one boring immediately under the drain outfall, and from three borings located downslope of the outfall in October 1994 (Figure 1-2). In three out of the four borings, two depth intervals were sampled; the first started at one foot below grade, and the second at 10 feet below the top of the first sampling interval (or 11 feet below grade). Samples were collected only from the shallow interval in OF-2, as auger refusal repeatedly occurred at seven feet below grade at that location (SNL/NM October 1994a). Soil samples were also collected at the darkroom trailer surface discharge location in May 1995 from two locations on the southwest side of Building 9820 (Figure 1-2). Samples were collected from these boreholes at the same depths below the surface as in the outfall boreholes. The first (or shallow) surface discharge location sampling interval also started at 1 foot below grade, and the deep interval started at 11 feet below grade (SNL/NM May 1995a).

The Geoprobe™ sampling system was used to collect subsurface soil samples at this site (Figure 3-1). The Geoprobe™ sampling tool was fitted with a butyl acetate (BA) sampling sleeve and was then hydraulically driven to the top of the designated sampling depth. The sampling tool was opened, and driven an additional two feet in order to fill the two-foot long by approximately 1.25-inch diameter BA sleeve. The sampling tool and soil-filled sleeve were then retrieved from the borehole. In order to minimize the potential for loss of volatile compounds (if present), the soil to be analyzed for VOCs was not emptied from the BA sleeve into another sample container. The filled BA sleeve was removed from the sampling tool, and the top seven inches were cut off. Both ends of the seven-inch section of filled sleeve were immediately capped with a teflon membrane and rubber end cap, sealed with tape, and placed in an ice-filled cooler at the site. The soil in this section of sleeve was submitted for a VOC analysis.

Soil from the remainder of the sleeve was then emptied into a decontaminated mixing bowl. Following this, one or two more two-foot sampling runs were completed at each interval in order to recover enough soil to satisfy sample volume requirements for the interval. Soil recovered from these additional runs was also emptied into the mixing bowl, and blended with soil from the first sampling run. The soil was then transferred from the bowl into sample containers using a decontaminated plastic spatula.

Drain outfall samples were sent to an offsite commercial laboratory and were analyzed for VOCs, SVOCs, RCRA metals, hexavalent chromium, and trailer surface discharge location samples were analyzed only for RCRA metals and cyanide by an offsite commercial laboratory. Samples were shipped to the offsite commercial laboratory by an overnight delivery service. Additional soil samples were collected from the seven drain outfall sampling intervals and the four surface discharge location intervals and were submitted to the SNL/NM ER field laboratory (field laboratory) for trinitrotoluene (TNT) analyses using a field screening immunoassay technique, as well as for soil pH determinations. Routine SNL/NM chain-of-custody and sample documentation procedures were employed for all samples.

There is no specific historical or process information indicating that radioactive constituents were used or released to the environment at this site. To account for gaps in information on releases from the drain outfall, samples were collected from each of the drain outfall sampling intervals and were analyzed by an offsite commercial laboratory for uranium isotopes. In addition, one composite sample was collected from the four drain outfall shallow sampling intervals, and a second composite sample was collected from the three drain outfall deep sampling intervals.

These composite samples were then screened for other radionuclides by SNL/NM gamma spectroscopy. No radiological samples were collected from the darkroom trailer surface discharge location because there was no evidence that radioactive constituents were ever used in or discharged from the trailer.

Quality assurance/quality control (QA/QC) samples collected at this site consisted of one set of duplicate soil samples that were analyzed for most of the same non-radiologic constituents as the other drain outfall soil samples, and one set of aqueous equipment rinsate samples analyzed for most of the same organic and inorganic constituents as the drain outfall soil samples, as well as isotopic uranium. Also, a soil trip blank sample was included with the shipment of ER Site 49 drain outfall soil samples and was analyzed for VOCs only. Acetone, 2-hexanone, 2-butanone (MEK), methylene chloride, toluene, and xylenes were detected in this soil trip blank by the laboratory. These common laboratory contaminants were either not detected, or were found in lower concentrations, in the site samples. Soil used for this trip blank was prepared by heating the material, and then transferring it immediately to the sample container. This heating process drives off any residual organic compounds (if present) and soil moisture that may be contained in the material. It is thought that when the soil trip blank container was opened at the laboratory, it immediately adsorbed both moisture and VOCs present in the laboratory atmosphere, and therefore became contaminated.

Summaries of constituents analyzed for and detected by either commercial laboratory analyses or by the SNL/NM field laboratory in these confirmatory samples are presented in Tables 3-2, 3-3, and 3-4. Results of the SNL/NM in-house gamma spectroscopy composite soil sample screening for other radionuclides are presented in Appendices A.2 and A.3. Complete soil sample analytical data packages are archived in the Environmental Operations Records Center and are readily available for review and verification (SNL/NM October 1994b and May 1995b).

3.7 Risk Analysis

As shown in Table 3-4, uranium-235/236 (U-235/236) was detected in the deep interval soil sample from borehole OF-3 and in field and duplicate samples from the shallow interval in borehole OF-4 at activity levels of 0.61, 0.32, and 0.67 picocuries per gram (pCi/g) respectively. These three activities are higher than the background 95th percentile activity level in the canyons area of 0.18 pCi/g for U-235 presented in the draft SNL/NM study of naturally-occurring constituents (IT March 1996). To further evaluate the site data for uranium isotopes with activities above the 95th percentile level, a risk assessment was performed. The risk calculation was designed to produce a conservatively large estimate of radiation dose to counter uncertainties in the soil analytical data.

Table 3-2

ER Site 49
Summary of Organic and Other Constituents, and pH Measurements in Confirmatory Soil Samples
Collected Near the Building 9820 Drain Outfall, and at the Darkroom Trailer Surface Discharge Location

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Figure 2)	Top of Sample Interval (fbgs)	VOCs Method 8240 Acetone	2-Hexa-none	MEK	Meth. Chloride	Toluene	Total Xylenes	SVOCs Method 8270 BEHP	Cyanide Method 9010/9012	TNT Screen Colorimetric method based on EPA 8515	Units	Soil pH ASTM Meth. 4972 (pH units)
Building 9820 Drain Outfall Soil and QA Samples:																
017970-1,2	Soil	Field	10/6/94	OF-1	1	ND	ND	ND	3.3 B,J	1.5 J	ND	ND	ND	ND	ug/kg	7.1
017971-1,2	Soil	Field	10/6/94	OF-1	11	ND	ND	ND	2.8 B,J	1.8 J	ND	ND	ND	ND	ug/kg	7.1
017972-1,2	Soil	Field	10/6/94	OF-2	1	ND	ND	ND	2.2 B,J	ND	ND	ND	ND	ND	ug/kg	7.4
017974-1,2	Soil	Field	10/6/94	OF-3	1	ND	ND	ND	2.8 B,J	ND	ND	190 J	ND	ND	ug/kg	7.1
017975-1,2	Soil	Field	10/6/94	OF-3	11	ND	ND	ND	2.2 B,J	ND	ND	ND	ND	ND	ug/kg	7.5
017973-1,2	Soil	Field	10/6/94	OF-4	1	ND	ND	ND	2.4 B,J	ND	ND	ND	ND	ND	ug/kg	7.3
017976-1,2	Soil	Dupl.	10/6/94	OF-4	1	ND	ND	ND	3 B,J	ND	ND	ND	ND	ND	ug/kg	NS
017977-1,2	Soil	Field	10/6/94	OF-4	11	ND	ND	ND	2.1 B,J	ND	ND	ND	ND	ND	ug/kg	7.4
018113-1,2,4	Water	EB	10/6/94	Site 49	NA	ND	ND	ND	1.6 J	ND	ND	15	ND	NS	ug/L	NA
018115-1	Soil	TB	10/6/94	Site 49	NA	200	8.8 J	69	20 B	4.6 J	3.2 J	NS	NS	NS	ug/kg	NS
Darkroom Trailer Surface Discharge Soil Samples:																
023849-2	Soil	Field	5/23/95	SD-1	1	NS	NS	NS	NS	NS	NS	NS	ND	NS	ug/kg	7.6
023850-2	Soil	Field	5/23/95	SD-1	11	NS	NS	NS	NS	NS	NS	NS	ND	NS	ug/kg	7.6
023851-2	Soil	Field	5/23/95	SD-2	1	NS	NS	NS	NS	NS	NS	NS	ND	NS	ug/kg	7.6
023852-2	Soil	Field	5/23/95	SD-2	11	NS	NS	NS	NS	NS	NS	NS	ND	NS	ug/kg	7.8
Laboratory Reporting Limit For Soil						10-20	10-20	10-20	5-10	5-10	5-10	330	500 or 2,000	1,000	ug/kg	
Laboratory Reporting Limit for Water						10	10	10	5	5	5	10	10	NA	ug/L	
Proposed Subpart S Action Level For Soil						8E+06	None	5E+07	9E+04	2E+07	2E+08	5E+04	2E+06	4E+04	ug/kg	

Notes:

B = Compound detected in associated blank sample
BEHP = Bis(2-Ethylhexyl)phthalate
1,1-DCE = 1,1-dichloroethylene
Dupl. = Duplicate soil sample
EB = Equipment rinsate blank
fbgs = feet below ground surface
J = Result is detected below the reporting limit, or is an estimated concentration.
Meth. Chloride = Methylene chloride
NA = Not applicable
ND = Not detected
None = No Subpart S action level proposed for this constituent
NS = No sample
QA = Quality assurance
SVOCs = Semivolatile organic compounds
TB = Trip blank
ug/kg = Micrograms per kilogram
ug/L = Micrograms per liter
VOCs = Volatile organic compounds
TNT = Trinitrotoluene

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Table 3-3

ER Site 49
Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples
Collected Near the Building 9820 Drain Outfall, and at the Darkroom Trailer Surface Discharge Location

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Figure 2)	Top of Sample Interval (fbgs)	RCRA Metals, Methods 6010 and 7470/7471 As	Ba	Cd	Cr, total	Pb	Hg	Se	Ag	Other Metals: Cr^{6+} Method 7196	Units
Building 9820 Drain Outfall Soil and QA Samples:															
017970-2	Soil	Field	10/6/94	OF-1	1	2	55.6	ND	6.7	4.9 J	0.073 J	ND	1.7	ND	mg/kg
017971-2	Soil	Field	10/6/94	OF-1	11	1.6	63	ND	7.8	5.5	ND	ND	ND	ND	mg/kg
017972-2	Soil	Field	10/6/94	OF-2	1	2	81.5	ND	10.7	7.7	ND	ND	ND	ND	mg/kg
017974-2	Soil	Field	10/6/94	OF-3	1	2	61.8	ND	7	6.6	ND	ND	ND	ND	mg/kg
017975-2	Soil	Field	10/6/94	OF-3	11	2.4	88.6	0.52	6.6	4.3 J	0.077 J	ND	ND	ND	mg/kg
017973-2	Soil	Field	10/6/94	OF-4	1	2.2	87.8	ND	7.2	5.3	0.06 J	ND	ND	ND	mg/kg
017976-2	Soil	Dupl.	10/6/94	OF-4	1	2.3	99.7	0.5	8.5	7.6	0.069 J	ND	ND	ND	mg/kg
017977-2	Soil	Field	10/6/94	OF-4	11	2.3	82.2	ND	7.1	7.5	ND	ND	ND	ND	mg/kg
018113-3	Water	EB	10/6/94	Site 49	NA	ND	ND	ND	ND	ND	ND	ND	ND	NS	mg/L
Darkroom Trailer Surface Discharge Soil Samples:															
023849-2	Soil	Field	5/23/95	SD-1	1	2.5	100	ND	8.1	7.8	ND	ND	ND	NS	mg/kg
023850-2	Soil	Field	5/23/95	SD-1	11	ND	110	ND	8.7	5.6	ND	ND	ND	NS	mg/kg
023851-2	Soil	Field	5/23/95	SD-2	1	2	96	ND	6.6	6.7	ND	ND	ND	NS	mg/kg
023852-2	Soil	Field	5/23/95	SD-2	11	2.1	150	ND	9.5	4.7 J	ND	ND	ND	NS	mg/kg
Laboratory Reporting Limit For Soil						1	1	0.5	1	5	0.1	0.5-0.8	1	0.05	mg/kg
Laboratory Reporting Limit For Water						0.01	0.01	0.005	0.01	0.003	0.0002	0.005	0.01	NS	mg/L
Number of SNL/NM Background Soil Sample Analyses *						453	87	502	16	200	218	16	539	393	NA
SNL/NM Soil Background Range *						0.015-9.7	25-180	0.1-7.1	7.5-17	6.5-100	0.05-1.2	1-2.9	0.0015-4	0.02-<2.5	mg/kg
SNL/NM Soil Background UTL or 95th Percentile *						5.6	163	1.6	19	41	<0.8	3.2	2	<2.5	mg/kg
Proposed Subpart S Action Level For Soil						0.50	6,000	80	80,000 **	400 ***	20	400	400	400 **	mg/kg

Notes:

As = Arsenic. Arsenic background concentrations presented above are based on analyses of surface soil samples collected in the Canyons Background, North, Southwest, Coyote Test Field (CTF), and Offsite areas.

Ba = Barium. Barium background concentrations presented above are based on analyses of surface soil samples collected in the Lower Canyons area.

Cd = Cadmium. Cadmium background concentrations presented above are based on analyses of surface soil samples collected in the North, Southwest, CTF, and Offsite areas.

Cr = Chromium. Chromium background concentrations presented above are based on analyses of surface soil samples collected in the Canyons Background area.

Cr^{6+} = Hexavalent chromium. Hexavalent chromium background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.

Pb = Lead. Lead background concentrations presented above are based on analyses of surface samples collected in the Lower Canyons and Upper Canyons areas.

Hg = Mercury. Mercury background concentrations presented above are based on analyses of surface soil samples collected in the Lower Canyons, Upper Canyons, and Canyons Background areas.

Se = Selenium. Selenium background concentrations presented above are based on analyses of surface soil samples collected in the Canyons Background area.

Ag = Silver. Silver background concentrations presented above are based on analyses of surface soil samples collected in the North, Southwest, CTF, and Offsite areas.

Dupl. = Duplicate soil sample
EB = Equipment rinsate blank
fbgs = Feet below ground surface
J = Result is detected below the reporting limit or is an estimated concentration.
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
NA = Not applicable
ND = Not detected
NS = No sample
QA = Quality assurance
UTL = Upper Tolerance Limit
* IT March 1996
** 80,000 mg/kg is for Cr^{3+} only. For Cr^{6+}, proposed Subpart S action level is 400 mg/kg.
*** No proposed Subpart S action level for lead in soil, 400 ppm is EPA proposed action level (EPA July 1994)

Table 3-4

ER Site 49
Summary of Isotopic Uranium in Confirmatory Soil Samples
Collected Near the Building 9820 Drain Outfall

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Figure 2)	Top of Sample Interval (fbgs)	Isotopic Uranium Method NAS-NS-3050 (units are pCi/g for soil, pCi/L for water) U-234 Result	U-234 Error *	U-234 M.D.A.	U-235/ U-236 Result	U-235/ U-236 Error *	U-235/ U-236 M.D.A.	U-238 Result	U-238 Error *	U-238 M.D.A.
Drain Outfall Soil and QA Samples:														
017970-5	Soil	Field	10/6/94	OF-1	1	0.31	0.08	0.01	0.024	0.017	0.012	0.29	0.07	0.01
017971-5	Soil	Field	10/6/94	OF-1	11	0.32	0.08	0.01	0.016	0.014	0.011	0.3	0.07	0.01
017972-5	Soil	Field	10/6/94	OF-2	1	0.45	0.12	0.01	0.1	0.05	0.02	0.32	0.09	0.01
017974-5	Soil	Field	10/6/94	OF-3	1	0.5	0.12	0.01	0.1	0.04	0.01	0.32	0.09	0.01
017975-5	Soil	Field	10/6/94	OF-3	11	0.95	0.24	0.03	0.61	0.18	0.03	0.76	0.2	0.03
017973-5	Soil	Field	10/6/94	OF-4	1	0.6	0.16	0.02	0.32	0.11	0.02	0.42	0.12	0.02
017976-5	Soil	Dupl.	10/6/94	OF-4	1	0.77	0.24	0.04	0.67	0.23	0.05	0.54	0.19	0.04
017977-5	Soil	Field	10/6/94	OF-4	11	0.56	0.14	0.02	0.094	0.044	0.015	0.42	0.11	0.01
018113-5	Water	EB	10/6/94	Site 49	NA	0.66	0.49	0.37	ND	0.009	0.414	0.084	0.168	0.227
Number of SNL/NM Background Soil Sample Analyses **						71			86			157		
SNL/NM Soil Background Range **						0.44-<21.4			0.01-0.52			0.153-2.86		
SNL/NM Soil Background 95th Percentile **						<21.4			0.18			2.31		

Notes:

U-234 = Uranium 234. Uranium 234 background concentrations presented above are based on analyses of surface soil samples collected from the Lower Canyons and Upper Canyons areas, and surface and subsurface soil samples from the Southwest area.

U-235 = Uranium 235. Uranium 235/236 background concentrations presented above are based on U-235 analyses of surface and subsurface soil samples collected in the North and Coyote Test Field (CTF) areas. Detection limits for the majority of the U-235 analyses of soil samples collected in the canyons areas were considered too high to allow use of the data for U-235 background calculation purposes, and are therefore not presented herein.

U-236 = Uranium 236

U-238 = Uranium 238. Uranium 238 background concentrations presented above are based on analyses of surface soil samples collected from the Lower Canyons and Upper Canyons areas, and surface and subsurface soil samples from the Southwest area.

Dupl. = Duplicate sample

M.D.A. = Minimum detec

The PIP in Appendix J, Section 1.3.6 stipulates that for the purpose of computing media action levels, the total radiation dose at a site should not be greater than 15 millirem/year (mrem/yr) (SNL/NM February 1995). 15 mrem/yr is also the maximum annual effective dose for all pathways that is being considered in the preliminary staff working draft of the EPA Radiation Site Cleanup regulation (EPA 1994). Therefore:

- if the dose estimate is unacceptable (greater than 15 mrem/yr), further investigation and remediation may be needed; or

- if the dose estimate is acceptable, the potential for health hazards at the site is extremely low, and further remedial actions are not needed.

The dose estimate for the U-235/236 isotope activity level cited above was computed using methods and equations promulgated in proposed Subpart S documentation (EPA July 1990). Accordingly, all calculations were based on the very conservative assumption that the receptor dose from radionuclides results from ingestion of 0.2 grams per day of contaminated soil for each of the 365 days in a year.

Calculation of radionuclide doses require values of dose conversion factors for internal radiation from ingestion [DCF(i)], which are used to convert radionuclide activities (in units of pCi/g) into effective dose equivalents (in units of mrem/yr). Published DCF(i) values were found for U-235 and U-236 (0.00025 mrem/pCi for both) (Gilbert et al., 1989); this DCF(i) value was used in the risk calculation.

To assure that the computed doses were conservatively large, the maximum observed activity of U-235/236 detected at this site (0.67 pCi/g) was employed in the risk calculation. Following proposed Subpart S methodology, the equation and parameter values used to calculate the summed radiation dose was:

$$DOSE = \sum[DSR(i) \times S(i)]$$

where DOSE = total effective dose equivalent (mrem/yr);
DSR(i) = dose-to-soil concentration ratio for the i^{th} radionuclide = I x DCF(i);
I = soil ingestion rate = 0.2 grams/day = 73 grams/year;
DCF(i)= internal radiation dose conversion factor for the ith radionuclide (mrem/pCi); and
S(i) = soil concentration of the ith radionuclide (pCi/g).

The results of the radionuclide risk calculations show that the radiation dose (0.0122 mrem/yr) from the highest U-235/236 activity detected (0.67 pCi/g) is much less than 15 mrem/yr. Therefore, the site is considered to be risk-free in terms of radionuclide contamination.

3.8 Rationale for Pursuing a Risk-Based NFA Decision

The passive soil gas survey identified aliphatic compounds in soil gas at two of the five sampling locations at the site. However, subsequent laboratory analysis of soil samples from locations around the drain outfall did not detect the presence of any organic contaminants.

Confirmatory soil sampling beneath and downslope of the point of discharge around the drain outfall did not identify any residual COCs indicating past discharges that could pose a threat to human health or the environment. As shown on Table 3-2, the two VOC compounds (methylene chloride and toluene) that were detected in the drain outfall soil samples were identified only at below-reporting-limit concentrations, and are common laboratory contaminants. A single SVOC constituent [bis(2-ethylhexyl)phthalate, or BEHP] was identified at a below-reporting-limit concentration in a single drain outfall sampling interval, and was not identified in any other drain outfall soil sample. This BEHP "hit" is believed to represent laboratory rather than environmental contamination because it was also detected in the ER Site 49 aqueous equipment blank sample, and is a commonly reported SVOC laboratory contaminant.

Cyanide was not identified in any of the drain outfall or surface discharge location samples, and TNT was not detected in the drain outfall samples. Also, the pH measurements of soil from both the drain outfall and darkroom trailer surface discharge location sampling intervals were essentially neutral.

As shown on Table 3-3, soil sample analytical results indicate that the nine metals that were targeted in the Site 49 investigation were either (1) not detected, or (2) were detected in concentrations below the background UTL or 95th percentile concentrations of those metals presented in the SNL/NM study of naturally occurring constituents (IT March 1996), or (3) were detected in concentrations well below the respective Subpart S or other action levels for the metals.

In addition, isotopic uranium activities detected in the drain outfall soil samples were found to be below the 95th percentile background activity levels presented in the IT March 1996 report for those radionuclides (Table 3-4), or were determined to result in a radiation dose much lower than the maximum acceptable radiation dose of 15 mrem/yr presented in the PIP (SNL/NM February 1995).

Finally, the gamma spectroscopy semi-qualitative screening of the drain outfall shallow and deep interval composite samples did not indicate anything other than naturally occurring radionuclides at this location (Appendices A.2 and A.3).

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4. CONCLUSION

Sample analytical results generated from this confirmatory sampling investigation have shown that detectable or significant concentrations of COCs are not present in soils at ER Site 49, and that additional investigations are unwarranted and unnecessary. Based on archival information and chemical and radiological analytical results of soil samples collected at the drain outfall and at the darkroom trailer surface discharge location, SNL/NM has demonstrated that any hazardous waste or COCs that may have been released to the environment at this site do not pose a significant or unacceptable level of risk under current and projected future land use (Criterion 5 of Section 1.2), and the site does not pose a threat to human health or the environment. Therefore, ER Site 49 is recommended for an NFA determination.

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